REMARKS

Claims 8-16, 21-30 and 32 are presently pending. Claims 14-16, 22-24 and 28-30 have been withdrawn from consideration. Claims 8-13, 21, 25-27 and 32 have been rejected. No claims have been amended, canceled or added herein.

I. Claim Rejections under 35 U.S.C. § 103

Claims 8-13, 21, 25-27 and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publication No. 2002/0027257 to Kinsman, et al. ("Kinsman") alone. In particular, the Office Action states, "Kinsman discloses . . . a plurality of solder bumps 20/32 (fig. 1f) . . . and a single support coating 30 (fig. 1f) . . . [that] has been fully cured . . . prior to any reflow of any of said . . . solder bumps." The Office Action also states, "it would have been obvious . . . to modify the invention of Kinsman with specific ranges for the support coating's height relative to the bumps." Applicants respectfully traverse these rejections.

Applicants respectfully submit that a *prima facie* case of obviousness has not been made for several reasons. To establish a *prima facie* case of obviousness, a given prior art reference must teach or suggest all claim limitations. *See, e.g.*, MPEP § 2143. In addition, there must be a reasonable expectation of success when making a proposed modification to the prior art. *See id.* Furthermore, there must be some suggestion or motivation, either in the prior art itself or in the knowledge generally available to one of ordinary skill in the art, to modify a reference. *See id.* Applicants respectfully submit that none of these three requirements are met by the obviousness rejections as set forth in the Office Action.

<u>All Claim Limitations Not Within The Prior Art</u>

In order to render a claim as obvious, a reference must contain or suggest every material element of that claim. *See* MPEP § 2143. Yet, several material claim elements are

not present in Kinsman and/or have been misinterpreted as being in Kinsman in the pending Final Office Action. For example, independent claims 8, 13 and 32 all recite the limitations of "a plurality of solder bumps," and also "wherein the height of said [] support coating is from about 20 percent to about 70 percent of the pre-reflow height of said solder bumps." Because these are the only pending independent claims, all claims require these limitations of a plurality of solder bumps and a support coating having a height from about 20 to about 70 percent of the pre-reflow height of the solder bumps. Applicants respectfully submit that Kinsman does not teach or suggest the combination of a plurality of solder bumps and a support coating that meets any of the height limitations present in the pending claims.

Although the Final Office Action states, "Kinsman discloses . . . a plurality of solder bumps 20/32 (fig. 1f)," Applicants respectfully submit that this is an inaccurate assessment of Kinsman. In particular, item 20 of Kinsman is not a solder bump or part of a solder bump, but rather what is understood in the art to be an underbump metallization layer (UBM) used to facilitate a metallurgical bond between a contact pad and a solder bump. Kinsman itself states, "intermediate conductive elements 20 may be of a layer or layers of metals which will provide a better metallurgical bond therebetween. One such example . . . would be to form intermediate conductive elements 20 of three superimposed layers (top to bottom) of copper, copper/chromium alloy, and chromium." Kinsman at [0023], lines 11-17.

Regardless of the construction of item 20 of Kinsman, it is inappropriate to consider a combination of one of items 20 with a corresponding one of items 32 as a single solder bump for additional reasons. As explained in Kinsman, intermediate conductive elements 20 are formed and then covered by encapsulant material 30 before external conductive elements 32 are ever formed. Kinsman at [0023] – [0029]. Also, "Temperatures [and times] used to accomplish the reflowing of the solder paste [for external conductive elements 32] . . . must [] be closely controlled to prevent melting or decomposition of . . . intermediate conductive

elements 20." Kinsman at [0029]. Thus, Kinsman contemplates that a reflow process of its chip scale package should result in a reflow of its external conductive elements 32, but *not* a reflow of its intermediate conductive elements 20. Since elements 20 and 32 of Kinsman are created separately, are intended to perform different functions, and are intended to behave differently during an actual reflow operation, these elements do not operate in conjunction to form "solder bumps 20/32" as stated in the Final Office Action.

At best, Kinsman teaches a plurality solder balls 32 that are reflowed in a typical manner. However, solder balls 32 are not provided with any suitable support coating, as required by the present claims. The encapsulant material 30 of Kinsman is *not* a support coating in the sense of the present invention, since this encapsulant material does not rise to any height with respect to solder balls 32, and thus does not provide support to any portion of solder balls 32 during a reflow process. As noted above, Kinsman explains that intermediate conductive elements 20 are not intended to melt or decompose during a reflow process, such that encapsulant material 30 is not a support coating with respect to elements 20 either. Further, encapsulant material 30 rises to 100% of the height of elements 20, and 0% of the height of elements 32, such that this material does not meet any of the height recitations for the claimed support coating in any event.

Regarding the ongoing allegations in the Office Action that Applicants have not established any criticality for the claimed dimensions, Applicants respectfully incorporate all remarks from prior Responses that fully address this issue. As noted previously and in greater detail, significant portions of the written description and figures as filed are devoted toward the criticality of providing a support coating having a specific height range with respect to the solder bumps. In particular, paragraphs 0039 through 0041 and FIGS. 5A through 7B of the application as originally filed directly address the need for specific height ranges for the support coating. Because Kinsman does not teach a support coating having a

height from about 20 percent to about 70 percent of the pre-reflow height of any solder bumps, and because all pending claims requite this element of a support coating height with respect to solder bumps, Applicants respectfully submit that the pending obviousness rejections fail for at least this reason alone.

No Reasonable Expectation of Success In Modifying The Prior Art

Applicants agree with the Final Office Action that Kinsman does not teach a support coating having any claimed height range, and again assert that Kinsman does not teach a support coating at all. Assuming, *arguendo*, that the encapsulant material 30 might somehow comprise a support coating, Applicants respectfully submit that there would be no reason to experiment or alter the height of this encapsulant material to the specific ranges claimed by Applicants. A prior art reference must be considered in its entirety, including portions that would lead away from the claimed invention. *See*, MPEP § 2141.02. As taught by Kinsman, the function of its encapsulant material 30 is "to encapsulate at least the active surface . . . to cover the intermediate conductive elements [20] and is then planarized to expose the intermediate conductive elements." Kinsman at [0012]. Only then are solder balls 32 added to the package, and then entirely above the surface of the encapsulate material 30. As such, the height of the encapsulant material is intended to be equal to the height of the intermediate conductive elements 20 and not to rise to any of the height of solder balls 32. No reason or motivation is given for adjusting either of these heights, and there is no reason to expect any greater success in the objectives of Kinsman by making such a modification.

Furthermore, the function of the claimed support coating is to *support* a solder bump, and thereby prevent or limit any solder bump movement. Too much movement of the solder bumps in the claimed invention result in cracking and failure, which is the very nature of the problem that the claimed support coating is intended to prevent. Kinsman does not teach or suggest that its encapsulant layer is designed to provide support to any of its conductive

elements 20 or 32. To the extent that any proposed modification to the teachings of Kinsman would result in an encapsulant layer 30 that is within 20 to 70 percent of the height of either of elements 20 or 32, this would result in the detriment of the overall intentions and teachings of Kinsman to provide a 100% encapsulant layer to its set of intermediate conductive elements 20 only. Accordingly, there is no reasonable expectation of success in Kinsman if this reference were to be modified in the manner proposed. As such, Applicants respectfully submit that the pending obviousness rejections also fail for this reason alone.

No Motivation To Modify In The Prior Art

As noted previously, Kinsman never teaches or suggests a support coating for solder bumps at all, much less a support coating having a height of about 20 percent to about 70 percent of the pre-reflow height of any respective solder bumps. Again, Kinsman teaches of an encapsulant layer that is designed to fully encapsulate a set of intermediate conductive elements 20 that function as UBMs, and that are not designed to melt or decompose at all during a reflow process. As such, unlike the case of a conventional solder bump, there is fundamentally no reason to provide any support to prevent the shearing or cracking of this UBM 20 due to any thermal expansion in the components that it electrically couples. As such, it seems clear that there is no such motivation in the prior art itself. In addition, the Final Office Action does not point to any motivation within the prior art itself for making any of the proposed modifications. Because there is no motivation to modify the prior art within the prior art itself, Applicants respectfully submit that the pending obviousness rejections also fail for at least this reason alone.

For at least each of the foregoing reasons, it is respectfully submitted that none of the pending claims are rendered as obvious by Kinsman. Accordingly, Applicants respectfully request that the pending obviousness rejections be withdrawn.

CONCLUSION

Applicants respectfully submit that all claims are in proper form and condition for patentability, and thus request a Notification of Allowance to that effect. It is believed that no fees are due at this time. If any fees are due in connection with this Response or for this application in general, however, then the Commissioner is hereby authorized to charge such fees to Deposit Account No. 50-0388, referencing Docket No. NSC1P131X3. If there are any questions or issues remaining, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

Respectfully Submitted,
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Date: December 11, 2006

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